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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
08/520,079	08/28/1995	SHUNPEI YAMAZAKI		1321

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EXAMINER
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RICHARDS, N DREW

ART UNIT	PAPER NUMBER
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2815

DATE MAILED: 02/21/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

**Office Action Summary**

Application No.

08/520,079

Applicant(s)

YAMAZAKI ET AL.

Examiner

N. Drew Richards

Art Unit

2815

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on 12 December 2005.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 73-116, 123-141 and 143-155 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 73-116, 123-141 and 143-155 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 28 August 1995 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some \* c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

- |  |   |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)  | 4) <input type="checkbox"/> Interview Summary (PTO-413)<br>Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)                                   | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152)             |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)<br>Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____  |

### DETAILED ACTION

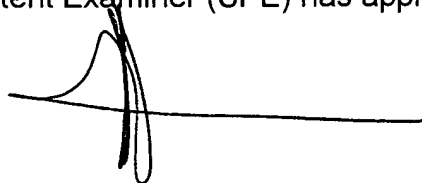
1. In view of the Appeal Brief filed on 12/12/05, PROSECUTION IS HEREBY REOPENED. New grounds of rejection are set forth below.

To avoid abandonment of the application, appellant must exercise one of the following two options:

(1) file a reply under 37 CFR 1.111 (if this Office action is non-final) or a reply under 37 CFR 1.113 (if this Office action is final); or,

(2) initiate a new appeal by filing a notice of appeal under 37 CFR 41.31. A new notice of appeal fee and appeal brief fee will not be required for applicant to appeal from the new Office action. Any appeal brief filed on or after September 13, 2004 must comply with 37 CFR 41.37.

A Supervisory Patent Examiner (SPE) has approved of reopening prosecution by signing below:



2. The rejections and arguments presented in this Office Action are in response to applicant's appeal brief in order to better respond to the issues at hand and present a rejection that is complete when the record is taken as a whole. In applicant's appeal brief, as well as in their previous responses, evidence has been provided by the applicant to support applicant's argument that grain boundaries will inherently form under the channel region in the device and method of Zhang et al. Applicant has presented two references as evidence in support of their position, U.S. Patent No.'s

5,894,137 and 6,011,275. The rejections and response to arguments below will show that:

- the evidence presented does not prove that grain boundaries other than boundaries 4 of Zhang et al. exist in the device of Zhang et al.;
- assuming, *arguendo*, that even if grain boundaries other than those explicitly taught by Zhang et al. exist, the evidence has not shown that these alleged grain boundaries will exist in the specific location of the channel region of Zhang et al.; and
- assuming, *arguendo*, that even if the alleged grain boundaries must necessarily exist in the channel region of Zhang et al., it would have been obvious to one of ordinary skill in the art at the time of the invention to modify Zhang to form the channel regions in areas where the grain boundaries do not exist.

### ***Claim Rejections - 35 USC § 103***

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

4. Claims 73-116, 123-141 and 143-155 are rejected under 35 U.S.C. 103(a) as being obvious over Zhang et al. (USPAT 5,563,426, Zhang).

The applied reference appears to have a common assignee with the instant application. Based upon the earlier effective U.S. filing date of the reference, it constitutes prior art only under 35 U.S.C. 102(e). This rejection under 35 U.S.C. 103(a) might be overcome by: (1) a showing under 37 CFR 1.132 that any invention disclosed but not claimed in the reference was derived from the inventor of this application and is thus not an invention "by another"; (2) a showing of a date of invention for the claimed subject matter of the application which corresponds to subject matter disclosed but not claimed in the reference, prior to the effective U.S. filing date of the reference under 37 CFR 1.131; or (3) an oath or declaration under 37 CFR 1.130 stating that the application and reference are currently owned by the same party and that the inventor named in the application is the prior inventor under 35 U.S.C. 104, together with a terminal disclaimer in accordance with 37 CFR 1.321(c). This rejection might also be overcome by showing that the reference is disqualified under 35 U.S.C. 103(c) as prior art in a rejection under 35 U.S.C. 103(a). See MPEP § 706.02(I)(1) and § 706.02(I)(2).

With regard to claim 73, Zhang discloses in figure 4c a thin film transistor. Zhang discloses in figures 1a – 1c, 2a - 2d, and 4a – 4c a crystalline semiconductor island (3) over a substrate (1a) having an insulating surface (1b). Zhang discloses in figures 4b and 4c source (25a and 25c) and drain regions (25b and 25d) in said semiconductor island. Zhang discloses in figure 4b a channel forming region (between 25a and 25b in figure 4b) between said source and drain regions. Zhang discloses in figures 4a – 4c a gate insulating film (22) adjacent to at least said channel forming region. Zhang

Art Unit: 2815

discloses in figures 1a- 1c, 2a – 2d, and 4a – 4c a gate electrode (23a) adjacent to said channel forming region having said gate insulating film therebetween, wherein said channel forming region has no grain boundary (4). No differences have been pointed out in the formation of the channel forming region of Zhang and the channel forming region of the current pending claim in view of the currently pending specification.

Therefore Zhang must teach in figures 1a – 1c, 2a – 2d and 4a – 4c wherein said semiconductor island includes a spin density not higher than  $1 \times 10^{17} \text{ cm}^{-3}$ , because an identical spin density is a property that must be shared by products that result from two processes that are the same. Zhang discloses in figures 4c and column 11, lines 47 – 56 wherein said crystalline semiconductor island includes hydrogen at concentration less than  $1 \times 10^{20} \text{ cm}^{-3}$  (i.e. the known atomic density of Si is  $10^{22} \text{ cm}^{-3}$ , less than 5% of  $10^{22}$  is less than  $10^{20}$ ). It is not clear if Zhang teaches that the hydrogen concentration is not greater than  $1 \times 10^{20} \text{ cm}^{-3}$ . MPEP 2144.05 states that overlapping ranges are obvious. It would have been obvious to one of ordinary skill in the art to use the hydrogen atom concentration of not greater than  $1 \times 10^{20} \text{ cm}^{-3}$  in the device of Zhang because the current claimed range and the disclosed range in Zhang overlap. Further, any changes in particular device concentrations or properties would have been routine experimentation for one of ordinary skill seeking to maximize device function in the device of Zhang.

With regard to claim 74, Zhang discloses in figures 1a, 1b, and 2a; and column 6, lines 19 – 40 wherein the crystalline semiconductor island comprise a material of Ni.

With regard to claim 75, Zhang discloses in figures 1a, 1b, and 2a; and column 6, lines 19 – 40 a thin film transistor wherein said material is included in said semiconductor island at a concentration less than  $5 \times 10^{19} \text{ cm}^{-3}$ . It is not clear if Zhang teaches that the material is included in the semiconductor at a concentration not greater than  $5 \times 10^{19} \text{ cm}^{-3}$ . MPEP 2144.05 states that overlapping ranges are obvious. It would have been obvious to one of ordinary skill in the art to use the material included in the semiconductor at a concentration not greater than  $5 \times 10^{19} \text{ cm}^{-3}$  in the device of Zhang because the current claimed range and the disclosed range in Zhang overlap.

With regard to claim 76, Zhang discloses in column 9, lines 38 – 45 a thin film transistor wherein said semiconductor island includes the point defect (oxygen) of less  $1 \times 10^{18} \text{ cm}^{-3}$ . It is not clear if Zhang teaches wherein said semiconductor island includes a point defect of  $1 \times 10^{16} \text{ cm}^{-3}$  or more. MPEP 2144.05 states that overlapping ranges are obvious. It would have been obvious to one of ordinary skill in the art to have said semiconductor island include a point defect of  $1 \times 10^{16} \text{ cm}^{-3}$  or more in the device of Zhang because the current claimed range and the disclosed range in Zhang overlap. Zhang teaches in column 11, lines 47 – 56 that is obvious to have the hydrogen element for neutralizing the point defect at a concentration of  $1 \times 10^{18}$ .

With regard to claim 77, it is obvious in Zhang wherein said semiconductor island includes the spin density not lower than  $1 \times 10^{15} \text{ cm}^{-3}$ .

With regard to claim 78, Zhang discloses in column 4, lines 18 – 20 wherein said semiconductor island is a silicon island.

With regard to claim 79, Zhang discloses in column 9, lines 38 – 43 wherein the crystalline semiconductor island includes carbon and nitrogen at a concentration less than  $1 \times 10^{18} \text{ cm}^{-3}$ , and oxygen at a concentration less than  $1 \times 10^{18} \text{ cm}^{-3}$ . It is not clear if Zhang teaches that said crystalline semiconductor island includes carbon and nitrogen at a concentration not lower than  $1 \times 10^{16} \text{ cm}^{-3}$ , and oxygen at a concentration not lower than  $1 \times 10^{17} \text{ cm}^{-3}$ . MPEP 2144.05 states that overlapping ranges are obvious. It would have been obvious to one of ordinary skill in the art to use carbon and nitrogen at a concentration not lower than  $1 \times 10^{16} \text{ cm}^{-3}$ , and oxygen at a concentration not lower than  $1 \times 10^{17} \text{ cm}^{-3}$  in the device of Zhang because the current claimed range and the disclosed range in Zhang overlap.

With regard to claim 80, Zhang discloses in figure 4c a thin film transistor. Zhang discloses in figures 1a – 1c, 2a – 2d, and 4a – 4c a crystalline semiconductor island on an insulating surface. Zhang discloses in figures 4b and 4c source and drain regions in said semiconductor island. Zhang discloses in figure 4b a channel forming region between said source and drain regions. Zhang discloses in figures 4a – 4c a gate insulating film on at least said channel forming region. Zhang discloses in figures 1a- 1c, 2a – 2d, and 4a – 4c a gate electrode over said channel forming region having said gate insulating film therebetween, wherein said channel forming region has no grain boundary. Zhang discloses in column 9, lines 38 – 45 a thin film transistor wherein said semiconductor island includes the point defect (oxygen) of less  $1 \times 10^{18} \text{ cm}^{-3}$ . It is not clear if Zhang teaches wherein said semiconductor island includes a point defect of  $1 \times 10^{16} \text{ cm}^{-3}$  or more. MPEP 2144.05 states that overlapping ranges are obvious. It



Art Unit: 2815

would have been obvious to one of ordinary skill in the art to have said semiconductor island include a point defect of  $1 \times 10^{16} \text{ cm}^{-3}$  or more in the device of Zhang because the current claimed range and the disclosed range in Zhang overlap. Zhang discloses in figures 4c and column 11, lines 47 – 56 wherein said crystalline semiconductor island includes hydrogen at concentration less than  $1 \times 10^{20} \text{ cm}^{-3}$  (i.e. the known atomic density of Si is  $10^{22} \text{ cm}^{-3}$ , less than 5% of  $10^{22}$  is less than  $10^{20}$ ). It is not clear if Zhang teaches that the hydrogen concentration is not higher than  $1 \times 10^{20} \text{ cm}^{-3}$ . MPEP 2144.05 states that overlapping ranges are obvious. It would have been obvious to one of ordinary skill in the art to use the hydrogen atom concentration of not higher than  $1 \times 10^{20} \text{ cm}^{-3}$  in the device of Zhang because the current claimed range and the disclosed range in Zhang overlap. Further, any changes in particular device concentrations or properties would have been routine experimentation for one of ordinary skill seeking to maximize device function in the device of Zhang.

With regard to claim 81, Zhang discloses in figures 1a, 1b, and 2a; and column 6, lines 19 – 40 wherein the crystalline semiconductor island comprise a material of Ni.

With regard to claim 82, Zhang discloses in figures 1a, 1b, and 2a; and column 6, lines 19 – 40 a thin film transistor wherein said material is included in said semiconductor island at a concentration less than  $5 \times 10^{19} \text{ cm}^{-3}$ . It is not clear if Zhang teaches that the material is included in the semiconductor at a concentration not higher than  $5 \times 10^{19} \text{ cm}^{-3}$ . MPEP 2144.05 states that overlapping ranges are obvious. It would have been obvious to one of ordinary skill in the art to use the material included in the

semiconductor at a concentration not higher than  $5 \times 10^{19} \text{ cm}^{-3}$  in the device of Zhang because the current claimed range and the disclosed range in Zhang overlap.

With regard to claim 83, Zhang discloses in figures 4c and column 11, lines 47 – 56 wherein said semiconductor island includes hydrogen for neutralizing the point defect at a concentration less than  $1 \times 10^{20} \text{ cm}^{-3}$ . It is not clear if Zhang teaches that the hydrogen concentration is not lower than  $1 \times 10^{-15} \text{ cm}^{-3}$ . MPEP 2144.05 states that overlapping ranges are obvious. It would have been obvious to one of ordinary skill in the art to use the hydrogen atom concentration of not lower than  $1 \times 10^{-15} \text{ cm}^{-3}$  in the device of Zhang because the current claimed range and the disclosed range in Zhang overlap.

With regard to claim 84, No differences have been pointed out in the formation of the channel forming region of Zhang and the channel forming region of the current pending claim in view of the currently pending specification. Therefore Zhang must teach in figures 1a – 1c, 2a – 2d and 4a – 4c wherein said semiconductor island includes a spin density of  $1 \times 10^{15}$  to  $1 \times 10^{17} \text{ cm}^{-3}$ , because an identical spin density is a property that must be shared by products that result from two processes that are the same.

With regard to claim 85, Zhang discloses in column 4, lines 18 – 20 wherein said semiconductor island is a silicon island.

With regard to claim 86, Zhang discloses in column 9, lines 38 – 43 wherein the crystalline semiconductor island includes carbon and nitrogen at a concentration less than  $1 \times 10^{18} \text{ cm}^{-3}$ , and oxygen at a concentration less than  $1 \times 10^{18} \text{ cm}^{-3}$ . It is not clear

Art Unit: 2815

if Zhang teaches that said crystalline semiconductor island includes carbon and nitrogen at a concentration not lower than  $1 \times 10^{16} \text{ cm}^{-3}$ , and oxygen at a concentration not lower than  $1 \times 10^{17} \text{ cm}^{-3}$ . MPEP 2144.05 states that overlapping ranges are obvious. It would have been obvious to one of ordinary skill in the art to use carbon and nitrogen at a concentration not lower than  $1 \times 10^{16} \text{ cm}^{-3}$ , and oxygen at a concentration not lower than  $1 \times 10^{17} \text{ cm}^{-3}$  in the device of Zhang because the current claimed range and the disclosed range in Zhang overlap.

With regard to claim 87, Zhang discloses in figure 4c a semiconductor device. Zhang discloses in figures 1a – 1c, 2a - 2d, and 4a – 4c a crystalline semiconductor island on an insulating surface. Zhang discloses in figures 4b and 4c source and drain regions in said semiconductor island. Zhang discloses in figure 4b a channel forming region between said source and drain regions. Zhang discloses in figures 1a- 1c, 2a – 2d, and 4a – 4c a gate insulating film adjacent to at least said channel forming region. Zhang discloses in figures 1a- 1c, 2a – 2d, and 4a – 4c a gate electrode adjacent to said channel forming region having said gate insulating film therebetween, wherein said crystalline semiconductor island is formed in a monodomain region which contains no grain boundary. Zhang discloses in figures 4c and column 11, lines 47 – 56 wherein said crystalline semiconductor island includes hydrogen at concentration less than  $1 \times 10^{20} \text{ cm}^{-3}$  (i.e. the known atomic density of Si is  $10^{22} \text{ cm}^{-3}$ , less than 5% of  $10^{22}$  is less than  $10^{20}$ ). It is not clear if Zhang teaches that the hydrogen concentration is not higher than  $1 \times 10^{20} \text{ cm}^{-3}$ . MPEP 2144.05 states that overlapping ranges are obvious. It would have been obvious to one of ordinary skill in the art to use the hydrogen atom

Art Unit: 2815

concentration of not higher than  $1 \times 10^{20} \text{ cm}^{-3}$  in the device of Zhang because the current claimed range and the disclosed range in Zhang overlap. Zhang discloses in column 9, lines 38 – 45 wherein the semiconductor device includes a p-channel thin film transistor having a mobility in a range of  $20 - 100 \text{ cm}^2/\text{Vs}$ . Zhang is silent to the fact that the semiconductor device includes a p-channel thin film transistor having mobility in a range of  $200-400 \text{ cm}^2/\text{Vs}$ . Mobility is a function of the purity of the single crystal (monodomain) semiconductor. MPEP section 2144.04, VII teaches that it is obvious to one of ordinary skill in the art to have a more purely defect free p-channel monodomain region with mobility in a range of  $200-400 \text{ cm}^2/\text{Vs}$  in the device of Zhang. This is because the prior art teaches a suitable method for obtaining the claimed mobility, and that fact that the monodomain region of Zhang has the same utility as that of the claimed invention. Further, any changes in particular device concentrations or properties would have been routine experimentation for one of ordinary skill seeking to maximize device function in the device of Zhang.

With regard to claim 88, Zhang discloses in figures 1a, 1b, and 2a; and column 6, lines 19 – 40 wherein said crystalline semiconductor island comprises a material Ni.

With regard to claim 89, Zhang discloses in figures 1a, 1b, and 2a; and column 6, lines 19 – 40 a thin film transistor wherein said material is included in said semiconductor island at a concentration less than  $5 \times 10^{19} \text{ cm}^{-3}$ . It is not clear if Zhang teaches that the material is included in the semiconductor at a concentration not higher than  $5 \times 10^{19} \text{ cm}^{-3}$ . MPEP 2144.05 states that overlapping ranges are obvious. It would have been obvious to one of ordinary skill in the art to use the material included in the

semiconductor at a concentration not higher than  $5 \times 10^{19} \text{ cm}^{-3}$  in the device of Zhang because the current claimed range and the disclosed range in Zhang overlap.

With regard to claim 90, Zhang discloses in column 4, lines 18 – 20 wherein said semiconductor island is a silicon island.

With regard to claim 91, Zhang discloses in column 9, lines 38 – 43 wherein the crystalline semiconductor island includes carbon and nitrogen at a concentration less than  $1 \times 10^{18} \text{ cm}^{-3}$ , and oxygen at a concentration less than  $1 \times 10^{18} \text{ cm}^{-3}$ . It is not clear if Zhang teaches that said crystalline semiconductor island includes carbon and nitrogen at a concentration not lower than  $1 \times 10^{16} \text{ cm}^{-3}$ , and oxygen at a concentration not lower than  $1 \times 10^{17} \text{ cm}^{-3}$ . MPEP 2144.05 states that overlapping ranges are obvious. It would have been obvious to one of ordinary skill in the art to use carbon and nitrogen at a concentration not lower than  $1 \times 10^{16} \text{ cm}^{-3}$ , and oxygen at a concentration not lower than  $1 \times 10^{17} \text{ cm}^{-3}$  in the device of Zhang because the current claimed range and the disclosed range in Zhang overlap.

With regard to claim 92, Zhang teaches in figures 1a, 1b, 2a – 2d; and column 12, lines 1 – 30 wherein said monodomain region has a grain size of  $50 \mu\text{m}$  or more. It should be noted that the crystal grains (3) grown around metal portions (2) must have a grain size of  $50 - 100 \mu\text{m}$  when the metal portions are set from  $25 - 50 \mu\text{m}$  apart as disclosed by Zhang in column 12, lines 1 – 30.

With regard to claim 93, Zhang discloses in figure 4c semiconductor device. Zhang discloses in figures 1a – 1c, 2a - 2d, and 4a – 4c a crystalline semiconductor island on an insulating surface. Zhang discloses in figures 4b and 4c source and drain

Art Unit: 2815

regions in said semiconductor island. Zhang discloses in figure 4b a channel forming region between said source and drain regions. Zhang discloses in figures 1a- 1c, 2a – 2d, and 4a – 4c a gate insulating film adjacent to at least said channel forming region. Zhang discloses in figures 1a- 1c, 2a – 2d, and 4a – 4c a gate electrode adjacent to said channel forming region having said gate insulating film therebetween, wherein said channel forming region is formed in a monodomain region which contains no grain boundary. Zhang discloses in figures 4c and column 11, lines 47 – 56 wherein said crystalline semiconductor island includes hydrogen at concentration less than  $1 \times 10^{20} \text{ cm}^{-3}$  (i.e. the known atomic density of Si is  $10^{22} \text{ cm}^{-3}$ , less than 5% of  $10^{22}$  is less than  $10^{20}$ ). It is not clear if Zhang teaches that the hydrogen concentration is not higher than  $1 \times 10^{20} \text{ cm}^{-3}$ . MPEP 2144.05 states that overlapping ranges are obvious. It would have been obvious to one of ordinary skill in the art to use the hydrogen atom concentration of not higher than  $1 \times 10^{20} \text{ cm}^{-3}$  in the device of Zhang because the current claimed range and the disclosed range in Zhang overlap. Zhang discloses in column 9, lines 38 – 45 wherein the semiconductor device includes a n-channel thin film transistor having a mobility in a range of  $30 - 150 \text{ cm}^2/\text{Vs}$ . Zhang is silent to the fact that the semiconductor device includes an n-channel thin film transistor having mobility in a range of  $500-1000 \text{ cm}^2/\text{Vs}$ . Mobility is a function of the purity of the single crystal (monodomain) semiconductor. MPEP section 2144.04, VII teaches that it is obvious to one of ordinary skill in the art to have a more purely defect free n-channel monodomain region with mobility in a range of  $500-1000 \text{ cm}^2/\text{Vs}$  in the device of Zhang. This is because the prior art teaches a suitable method for obtaining the claimed mobility, and

Art Unit: 2815

that fact that the monodomain region of Zhang has the same utility as that of the claimed invention. Further, any changes in particular device concentrations or properties would have been routine experimentation for one of ordinary skill seeking to maximize device function in the device of Zhang.

With regard to claim 94, Zhang discloses in figures 1a, 1b, and 2a; and column 6, lines 19 – 40 wherein said crystalline semiconductor island comprises a material Ni.

With regard to claim 95, Zhang discloses in figures 1a, 1b, and 2a; and column 6, lines 19 – 40 a thin film transistor wherein said material is included in said semiconductor island at a concentration less than  $5 \times 10^{19} \text{ cm}^{-3}$ . It is not clear if Zhang teaches that the material is included in the semiconductor at a concentration not higher than  $5 \times 10^{19} \text{ cm}^{-3}$ . MPEP 2144.05 states that overlapping ranges are obvious. It would have been obvious to one of ordinary skill in the art to use the material included in the semiconductor at a concentration not higher than  $5 \times 10^{19} \text{ cm}^{-3}$  in the device of Zhang because the current claimed range and the disclosed range in Zhang overlap.

With regard to claim 96, Zhang discloses in column 4, lines 18 – 20 wherein said semiconductor island is a silicon island.

With regard to claim 97, Zhang discloses in column 9, lines 38 – 43 wherein the crystalline semiconductor island includes carbon and nitrogen at a concentration less than  $1 \times 10^{18} \text{ cm}^{-3}$ , and oxygen at a concentration less than  $1 \times 10^{18} \text{ cm}^{-3}$ . It is not clear if Zhang teaches that said crystalline semiconductor island includes carbon and nitrogen at a concentration not lower than  $1 \times 10^{16} \text{ cm}^{-3}$ , and oxygen at a concentration not lower than  $1 \times 10^{17} \text{ cm}^{-3}$ . MPEP 2144.05 states that overlapping ranges are obvious. It would

have been obvious to one of ordinary skill in the art to use carbon and nitrogen at a concentration not lower than  $1 \times 10^{16} \text{ cm}^{-3}$ , and oxygen at a concentration not lower than  $1 \times 10^{17} \text{ cm}^{-3}$  in the device of Zhang because the current claimed range and the disclosed range in Zhang overlap.

With regard to claim 98, Zhang teaches in figures 1a, 1b, 2a – 2d; and column 12, lines 1 – 30 wherein said monodomain region has a grain size of 50  $\mu\text{m}$  or more. It should be noted that the crystal grains (3) grown around metal portions (2) must have a grain size of 50 – 100  $\mu\text{m}$  when the metal portions are set from 25 – 50  $\mu\text{m}$  apart as disclosed by Zhang in column 12, lines 1 – 30.

With regard to claim 99, Zhang discloses in figure 4c semiconductor device. Zhang discloses in column 9, lines 38 – 45 a p-channel thin film transistor. Zhang discloses in column 9, lines 38 – 45 an n-channel thin film transistor. Zhang discloses in figures 1a – 1c, 2a – 2d, and 4a – 4c a crystalline semiconductor island on an insulating surface. Zhang discloses in figures 4b and 4c source and drain regions in said semiconductor island. Zhang discloses in figure 4b a channel forming region between said source and drain regions. Zhang discloses in figures 1a- 1c, 2a – 2d, and 4a – 4c a gate insulating film adjacent to at least said channel forming region. Zhang discloses in figures 1a- 1c, 2a – 2d, and 4a – 4c a gate electrode adjacent to said channel forming region having said gate insulating film therebetween, wherein said crystalline semiconductor island is formed in a monodomain region which contains no grain boundary. Zhang discloses in figures 4c and column 11, lines 47 – 56 wherein said crystalline semiconductor island includes hydrogen at concentration less than  $1 \times 10^{20}$



Art Unit: 2815

$\text{cm}^{-3}$  (i.e. the known atomic density of Si is  $10^{22} \text{ cm}^{-3}$ , less than 5% of  $10^{22}$  is less than  $10^{20}$ ). It is not clear if Zhang teaches that the hydrogen concentration is not higher than  $1 \times 10^{20} \text{ cm}^{-3}$ . MPEP 2144.05 states that overlapping ranges are obvious. It would have been obvious to one of ordinary skill in the art to use the hydrogen atom concentration of not higher than  $1 \times 10^{20} \text{ cm}^{-3}$  in the device of Zhang because the current claimed range and the disclosed range in Zhang overlap. Further, any changes in particular device concentrations or properties would have been routine experimentation for one of ordinary skill seeking to maximize device function in the device of Zhang.

With regard to claim 100, Zhang discloses in figures 1a, 1b, and 2a; and column 6, lines 19 – 40 wherein said crystalline semiconductor island comprises a material Ni.

With regard to claim 101, Zhang discloses in figures 1a, 1b, and 2a; and column 6, lines 19 – 40 a thin film transistor wherein said material is included in said semiconductor island at a concentration less than  $5 \times 10^{19} \text{ cm}^{-3}$ . It is not clear if Zhang teaches that the material is included in the semiconductor at a concentration not higher than  $5 \times 10^{19} \text{ cm}^{-3}$ . MPEP 2144.05 states that overlapping ranges are obvious. It would have been obvious to one of ordinary skill in the art to use the material included in the semiconductor at a concentration not higher than  $5 \times 10^{19} \text{ cm}^{-3}$  in the device of Zhang because the current claimed range and the disclosed range in Zhang overlap.

With regard to claim 102, Zhang discloses in column 4, lines 18 – 20 wherein said semiconductor island is a silicon island.

With regard to claim 103, Zhang discloses in column 9, lines 38 – 43 wherein the crystalline semiconductor island includes carbon and nitrogen at a concentration less

Art Unit: 2815

than  $1 \times 10^{18} \text{ cm}^{-3}$ , and oxygen at a concentration less than  $1 \times 10^{18} \text{ cm}^{-3}$ . It is not clear if Zhang teaches that said crystalline semiconductor island includes carbon and nitrogen at a concentration not lower than  $1 \times 10^{16} \text{ cm}^{-3}$ , and oxygen at a concentration not lower than  $1 \times 10^{17} \text{ cm}^{-3}$ . MPEP 2144.05 states that overlapping ranges are obvious. It would have been obvious to one of ordinary skill in the art to use carbon and nitrogen at a concentration not lower than  $1 \times 10^{16} \text{ cm}^{-3}$ , and oxygen at a concentration not lower than  $1 \times 10^{17} \text{ cm}^{-3}$  in the device of Zhang because the current claimed range and the disclosed range in Zhang overlap.

With regard to claim 104, Zhang teaches in figures 1a, 1b, 2a – 2d; and column 12, lines 1 – 30 wherein said monodomain region has a grain size of 50  $\mu\text{m}$  or more. It should be noted that the crystal grains (3) grown around metal portions (2) must have a grain size of 50 – 100  $\mu\text{m}$  when the metal portions are set from 25 – 50  $\mu\text{m}$  apart as disclosed by Zhang in column 12, lines 1 – 30.

With regard to claim 105, Zhang discloses in figure 4c semiconductor device. Zhang discloses in column 9, lines 38 – 45 a p-channel thin film transistor. Zhang discloses in column 9, lines 38 – 45 an n-channel thin film transistor. Zhang discloses in figures 1a – 1c, 2a - 2d, and 4a – 4c a crystalline semiconductor island on an insulating surface. Zhang discloses in figures 4b and 4c source and drain regions in said semiconductor island. Zhang discloses in figure 4b a channel forming region between said source and drain regions. Zhang discloses in figures 1a- 1c, 2a – 2d, and 4a – 4c a gate insulating film adjacent to at least said channel forming region. Zhang discloses in figures 1a- 1c, 2a – 2d, and 4a – 4c a gate electrode adjacent to said channel forming

region having said gate insulating film therebetween, wherein said channel forming region is formed in a monodomain region which contains no grain boundary. Zhang discloses in column 9, lines 38 – 43 wherein the crystalline semiconductor island includes carbon at a concentration less than  $1 \times 10^{18} \text{ cm}^{-3}$ . It is not clear if Zhang teaches that said crystalline semiconductor island includes carbon at a concentration not higher than  $5 \times 10^{18} \text{ cm}^{-3}$ . MPEP 2144.05 states that overlapping ranges are obvious. It would have been obvious to one of ordinary skill in the art to use carbon at a concentration not higher than  $5 \times 10^{18} \text{ cm}^{-3}$  in the device of Zhang because the current claimed range and the disclosed range in Zhang overlap. Zhang discloses in figures 4c and column 11, lines 47 – 56 wherein said crystalline semiconductor island includes hydrogen at concentration less than  $1 \times 10^{20} \text{ cm}^{-3}$  (i.e. the known atomic density of Si is  $10^{22} \text{ cm}^{-3}$ , less than 5% of  $10^{22}$  is less than  $10^{20}$ ). It is not clear if Zhang teaches that the hydrogen concentration is not higher than  $1 \times 10^{20} \text{ cm}^{-3}$ . MPEP 2144.05 states that overlapping ranges are obvious. It would have been obvious to one of ordinary skill in the art to use the hydrogen atom concentration of not higher than  $1 \times 10^{20} \text{ cm}^{-3}$  in the device of Zhang because the current claimed range and the disclosed range in Zhang overlap. Further, any changes in particular device concentrations or properties would have been routine experimentation for one of ordinary skill seeking to maximize device function in the device of Zhang.

With regard to claim 106, Zhang discloses in figures 1a, 1b, and 2a; and column 6, lines 19 – 40 wherein said crystalline semiconductor island comprises a material Ni.

With regard to claim 107, Zhang discloses in figures 1a, 1b, and 2a; and column 6, lines 19 – 40 a thin film transistor wherein said material is included in said semiconductor island at a concentration less than  $5 \times 10^{19} \text{ cm}^{-3}$ . It is not clear if Zhang teaches that the material is included in the semiconductor at a concentration not higher than  $5 \times 10^{19} \text{ cm}^{-3}$ . MPEP 2144.05 states that overlapping ranges are obvious. It would have been obvious to one of ordinary skill in the art to use the material included in the semiconductor at a concentration not higher than  $5 \times 10^{19} \text{ cm}^{-3}$  in the device of Zhang because the current claimed range and the disclosed range in Zhang overlap.

With regard to claim 108, Zhang discloses in column 4, lines 18 – 20 wherein said semiconductor island is a silicon island.

With regard to claim 109, Zhang discloses in column 9, lines 38 – 43 wherein the crystalline semiconductor island includes carbon and nitrogen at a concentration less than  $1 \times 10^{18} \text{ cm}^{-3}$ , and oxygen at a concentration less than  $1 \times 10^{18} \text{ cm}^{-3}$ . It is not clear if Zhang teaches that said crystalline semiconductor island includes carbon and nitrogen at a concentration not lower than  $1 \times 10^{16} \text{ cm}^{-3}$ , and oxygen at a concentration not lower than  $1 \times 10^{17} \text{ cm}^{-3}$ . MPEP 2144.05 states that overlapping ranges are obvious. It would have been obvious to one of ordinary skill in the art to use carbon and nitrogen at a concentration not lower than  $1 \times 10^{16} \text{ cm}^{-3}$ , and oxygen at a concentration not lower than  $1 \times 10^{17} \text{ cm}^{-3}$  in the device of Zhang because the current claimed range and the disclosed range in Zhang overlap.

With regard to claim 110, Zhang teaches in figures 1a, 1b, 2a – 2d; and column 12, lines 1 – 30 wherein said monodomain region has a grain size of 50  $\mu\text{m}$  or more. It

should be noted that the crystal grains (3) grown around metal portions (2) must have a grain size of 50 – 100  $\mu\text{m}$  when the metal portions are set from 25 – 50  $\mu\text{m}$  apart as disclosed by Zhang in column 12, lines 1 – 30.

With regard to claim 111, Zhang discloses in figure 4c semiconductor device. Zhang discloses in figures 8a and 8b; and column 9, lines 28 - 37 an active matrix circuit portion including at least a first thin film transistor. Zhang discloses in column 9, lines 38 – 45 a driving circuit portion including at least a second thin film transistor. Zhang discloses in figures 1a – 1c, 2a - 2d, and 4a – 4c a crystalline semiconductor island on an insulating surface. Zhang discloses in figures 4b and 4c source and drain regions in said semiconductor island. Zhang discloses in figure 4b a channel forming region between said source and drain regions. Zhang discloses in figures 1a- 1c, 2a – 2d, and 4a – 4c a gate insulating film adjacent to at least said channel forming region. Zhang discloses in figures 1a- 1c, 2a – 2d, and 4a – 4c a gate electrode adjacent to said channel forming region having said gate insulating film therebetween, wherein said crystalline semiconductor island is formed in a monodomain region which contains no grain boundary. Zhang discloses in figures 4c and column 11, lines 47 – 56 wherein said crystalline semiconductor island includes hydrogen at concentration less than  $1 \times 10^{20} \text{ cm}^{-3}$  (i.e. the known atomic density of Si is  $10^{22} \text{ cm}^{-3}$ , less than 5% of  $10^{22}$  is less than  $10^{20}$ ). It is not clear if Zhang teaches that the hydrogen concentration is not higher than  $1 \times 10^{20} \text{ cm}^{-3}$ . MPEP 2144.05 states that overlapping ranges are obvious. It would have been obvious to one of ordinary skill in the art to use the hydrogen atom concentration of not higher than  $1 \times 10^{20} \text{ cm}^{-3}$  in the device of Zhang because the current claimed

range and the disclosed range in Zhang overlap. Further, any changes in particular device concentrations or properties would have been routine experimentation for one of ordinary skill seeking to maximize device function in the device of Zhang.

With regard to claim 112, Zhang discloses in figures 1a, 1b, and 2a; and column 6, lines 19 – 40 wherein said crystalline semiconductor island comprises a material Ni.

With regard to claim 113, Zhang discloses in figures 1a, 1b, and 2a; and column 6, lines 19 – 40 a thin film transistor wherein said material is included in said semiconductor island at a concentration less than  $5 \times 10^{19} \text{ cm}^{-3}$ . It is not clear if Zhang teaches that the material is included in the semiconductor at a concentration not higher than  $5 \times 10^{19} \text{ cm}^{-3}$ . MPEP 2144.05 states that overlapping ranges are obvious. It would have been obvious to one of ordinary skill in the art to use the material included in the semiconductor at a concentration not higher than  $5 \times 10^{19} \text{ cm}^{-3}$  in the device of Zhang because the current claimed range and the disclosed range in Zhang overlap.

With regard to claim 114, Zhang discloses in column 4, lines 18 – 20 wherein said semiconductor island is a silicon island.

With regard to claim 115, Zhang discloses in column 9, lines 38 – 43 wherein the crystalline semiconductor island includes carbon and nitrogen at a concentration less than  $1 \times 10^{18} \text{ cm}^{-3}$ , and oxygen at a concentration less than  $1 \times 10^{18} \text{ cm}^{-3}$ . It is not clear if Zhang teaches that said crystalline semiconductor island includes carbon and nitrogen at a concentration not lower than  $1 \times 10^{16} \text{ cm}^{-3}$ , and oxygen at a concentration not lower than  $1 \times 10^{17} \text{ cm}^{-3}$ . MPEP 2144.05 states that overlapping ranges are obvious. It would have been obvious to one of ordinary skill in the art to use carbon and nitrogen at a

concentration not lower than  $1 \times 10^{16} \text{ cm}^{-3}$ , and oxygen at a concentration not lower than  $1 \times 10^{17} \text{ cm}^{-3}$  in the device of Zhang because the current claimed range and the disclosed range in Zhang overlap.

With regard to claim 116, Zhang teaches in figures 1a, 1b, 2a – 2d; and column 12, lines 1 – 30 wherein said monodomain region has a grain size of 50  $\mu\text{m}$  or more. It should be noted that the crystal grains (3) grown around metal portions (2) must have a grain size of 50 – 100  $\mu\text{m}$  when the metal portions are set from 25 – 50  $\mu\text{m}$  apart as disclosed by Zhang in column 12, lines 1 – 30.

With regard to claim 123, Zhang discloses in figure 4c a semiconductor device. Zhang discloses in figures 1a – 1c, 2a - 2d, and 4a – 4c a crystalline semiconductor island on an insulating surface. Zhang discloses in figures 4b and 4c source and drain regions in said semiconductor island. Zhang discloses in figure 4b a channel forming region between said source and drain regions. Zhang discloses in figures 1a- 1c, 2a – 2d, and 4a – 4c a gate insulating film adjacent to at least said channel forming region. Zhang discloses in figures 1a- 1c, 2a – 2d, and 4a – 4c a gate electrode adjacent to said channel forming region having said gate insulating film therebetween, wherein said crystalline semiconductor island is formed in a monodomain region which contains no grain boundary. Zhang discloses in column 9, lines 38 – 43 wherein the crystalline semiconductor island includes carbon and nitrogen at a concentration less than  $1 \times 10^{18} \text{ cm}^{-3}$ . It is not clear if Zhang teaches that said crystalline semiconductor island includes carbon and nitrogen at a concentration not higher than  $5 \times 10^{18} \text{ cm}^{-3}$ . MPEP 2144.05 states that overlapping ranges are obvious. It would have been obvious to one of

ordinary skill in the art to use carbon and nitrogen at a concentration not higher than  $5 \times 10^{18} \text{ cm}^{-3}$  in the device of Zhang because the current claimed range and the disclosed range in Zhang overlap. No differences have been pointed out in the formation of the channel forming region of Zhang and the channel forming region of the current pending claim in view of the currently pending specification. Therefore Zhang must teach in figures 1a – 1c, 2a – 2d and 4a – 4c wherein said semiconductor device has a S value of 0.03-0.3, because an identical S value is a property that must be shared by products that result from two processes that are the same. Zhang discloses in figures 4c and column 11, lines 47 – 56 wherein said crystalline semiconductor island includes hydrogen at concentration less than  $1 \times 10^{20} \text{ cm}^{-3}$  (i.e. the known atomic density of Si is  $10^{22} \text{ cm}^{-3}$ , less than 5% of  $10^{22}$  is less than  $10^{20}$ ). It is not clear if Zhang teaches that the hydrogen concentration is not higher than  $1 \times 10^{20} \text{ cm}^{-3}$ . MPEP 2144.05 states that overlapping ranges are obvious. It would have been obvious to one of ordinary skill in the art to use the hydrogen atom concentration of not higher than  $1 \times 10^{20} \text{ cm}^{-3}$  in the device of Zhang because the current claimed range and the disclosed range in Zhang overlap. Zhang discloses in column 9, lines 38 – 45 wherein the semiconductor device includes at least one selected from the group consisting of a p-channel thin film transistor and an n-channel thin film transistor. Zhang discloses in column 9, lines 38 – 45 wherein the semiconductor device includes a p-channel thin film transistor having a mobility in a range of 20 – 100  $\text{cm}^2/\text{Vs}$ . Zhang is silent to the fact that the semiconductor device includes a p-channel thin film transistor having mobility in a range of 200-400  $\text{cm}^2/\text{Vs}$ . Mobility is a function of the purity of the single crystal (monodomain)



semiconductor. MPEP section 2144.04, VII teaches that it is obvious to one of ordinary skill in the art to have a more purely defect free p-channel monodomain region with mobility in a range of 200-400  $\text{cm}^2/\text{Vs}$  in the device of Zhang. This is because the prior art teaches a suitable method for obtaining the claimed mobility, and that fact that the monodomain region of Zhang has the same utility as that of the claimed invention. Zhang discloses in column 9, lines 38 – 45 wherein the semiconductor device includes an n-channel thin film transistor having a mobility in a range of 30 – 150  $\text{cm}^2/\text{Vs}$ . Zhang is silent to the fact that the semiconductor device includes an n-channel thin film transistor having mobility in a range of 500-1000  $\text{cm}^2/\text{Vs}$ . Mobility is a function of the purity of the single crystal (monodomain) semiconductor. MPEP section 2144.04, VII teaches that it is obvious to one of ordinary skill in the art to have a more purely defect free n-channel monodomain region with mobility in a range of 500-1000  $\text{cm}^2/\text{Vs}$  in the device of Zhang. This is because the prior art teaches a suitable method for obtaining the claimed mobility, and that fact that the monodomain region of Zhang has the same utility as that of the claimed invention. Further, any changes in particular device concentrations or properties would have been routine experimentation for one of ordinary skill seeking to maximize device function in the device of Zhang.

With regard to claim 124, Zhang discloses in figures 1a, 1b, and 2a; and column 6, lines 19 – 40 wherein said crystalline semiconductor island comprises a material Ni.

With regard to claim 125, Zhang discloses in figures 1a, 1b, and 2a; and column 6, lines 19 – 40 a thin film transistor wherein said material is included in said semiconductor island at a concentration less than  $5 \times 10^{19} \text{ cm}^{-3}$ . It is not clear if Zhang

Art Unit: 2815

teaches that the material is included in the semiconductor at a concentration not higher than  $5 \times 10^{19} \text{ cm}^{-3}$ . MPEP 2144.05 states that overlapping ranges are obvious. It would have been obvious to one of ordinary skill in the art to use the material included in the semiconductor at a concentration not higher than  $5 \times 10^{19} \text{ cm}^{-3}$  in the device of Zhang because the current claimed range and the disclosed range in Zhang overlap.

With regard to claim 126, Zhang discloses in column 4, lines 18 – 20 wherein said semiconductor island is a silicon island.

With regard to claim 127, Zhang discloses in column 9, lines 38 – 43 wherein the crystalline semiconductor island includes carbon and nitrogen at a concentration less than  $1 \times 10^{18} \text{ cm}^{-3}$ , and oxygen at a concentration less than  $1 \times 10^{18} \text{ cm}^{-3}$ . It is not clear if Zhang teaches that said crystalline semiconductor island includes carbon and nitrogen at a concentration not lower than  $1 \times 10^{16} \text{ cm}^{-3}$ , and oxygen at a concentration not lower than  $1 \times 10^{17} \text{ cm}^{-3}$ . MPEP 2144.05 states that overlapping ranges are obvious. It would have been obvious to one of ordinary skill in the art to use carbon and nitrogen at a concentration not lower than  $1 \times 10^{16} \text{ cm}^{-3}$ , and oxygen at a concentration not lower than  $1 \times 10^{17} \text{ cm}^{-3}$  in the device of Zhang because the current claimed range and the disclosed range in Zhang overlap.

With regard to claim 128, Zhang teaches in figures 1a, 1b, 2a – 2d; and column 12, lines 1 – 30 wherein said monodomain region has a grain size of  $50 \mu\text{m}$  or more. It should be noted that the crystal grains (3) grown around metal portions (2) must have a grain size of  $50 - 100 \mu\text{m}$  when the metal portions are set from  $25 - 50 \mu\text{m}$  apart as disclosed by Zhang in column 12, lines 1 – 30.

With regard to claim 129, Zhang discloses in figure 4c semiconductor device. Zhang discloses in figures 1a – 1c, 2a – 2d, and 4a – 4c a crystalline semiconductor island on an insulating surface. Zhang discloses in figures 4b and 4c source and drain regions in said semiconductor island. Zhang discloses in figure 4b a channel forming region between said source and drain regions. Zhang discloses in figures 1a- 1c, 2a – 2d, and 4a – 4c a gate insulating film adjacent to at least said channel forming region. Zhang discloses in figures 1a- 1c, 2a – 2d, and 4a – 4c a gate electrode adjacent to said channel forming region having said gate insulating film therebetween, wherein said crystalline semiconductor island includes carbon and nitrogen at a concentration not higher than  $5 \times 10^{18} \text{ cm}^{-3}$ , wherein said channel forming region is formed in a monodomain region which contains no grain boundary. No differences have been pointed out in the formation of the channel forming region of Zhang and the channel forming region of the current pending claim in view of the currently pending specification. Therefore Zhang must teach in figures 1a – 1c, 2a – 2d and 4a – 4c wherein said semiconductor device has a S value of 0.03-0.3, because an identical S value is a property that must be shared by products that result from two processes that are the same. Zhang discloses in figures 4c and column 11, lines 47 – 56 wherein said crystalline semiconductor island includes hydrogen at concentration less than  $1 \times 10^{20} \text{ cm}^{-3}$  (i.e. the known atomic density of Si is  $10^{22} \text{ cm}^{-3}$ , less than 5% of  $10^{22}$  is less than  $10^{20}$ ). It is not clear if Zhang teaches that the hydrogen concentration is not higher than  $1 \times 10^{20} \text{ cm}^{-3}$ . MPEP 2144.05 states that overlapping ranges are obvious. It would have been obvious to one of ordinary skill in the art to use the hydrogen atom concentration

Art Unit: 2815

of not higher than  $1 \times 10^{20} \text{ cm}^{-3}$  in the device of Zhang because the current claimed range and the disclosed range in Zhang overlap. Zhang discloses in column 9, lines 38 – 45 wherein the semiconductor device includes at least one selected from the group consisting of a p-channel thin film transistor and an n-channel thin film transistor. Zhang discloses in column 9, lines 38 – 45 wherein the semiconductor device includes a p-channel thin film transistor having a mobility in a range of  $20 - 100 \text{ cm}^2/\text{Vs}$ . Zhang is silent to the fact that the semiconductor device includes a p-channel thin film transistor having mobility in a range of  $200-400 \text{ cm}^2/\text{Vs}$ . Mobility is a function of the purity of the single crystal (monodomain) semiconductor. MPEP section 2144.04, VII teaches that it is obvious to one of ordinary skill in the art to have a more purely defect free p-channel monodomain region with mobility in a range of  $200-400 \text{ cm}^2/\text{Vs}$  in the device of Zhang. This is because the prior art teaches a suitable method for obtaining the claimed mobility, and that fact that the monodomain region of Zhang has the same utility as that of the claimed invention. Zhang discloses in column 9, lines 38 – 45 wherein the semiconductor device includes an n-channel thin film transistor having a mobility in a range of  $30 - 150 \text{ cm}^2/\text{Vs}$ . Zhang is silent to the fact that the semiconductor device includes an n-channel thin film transistor having mobility in a range of  $500-1000 \text{ cm}^2/\text{Vs}$ . Mobility is a function of the purity of the single crystal (monodomain) semiconductor. MPEP section 2144.04, VII teaches that it is obvious to one of ordinary skill in the art to have a more purely defect free n-channel monodomain region with mobility in a range of  $500-1000 \text{ cm}^2/\text{Vs}$  in the device of Zhang. This is because the prior art teaches a suitable method for obtaining the claimed mobility, and that fact that the monodomain

Art Unit: 2815

region of Zhang has the same utility as that of the claimed invention. Further, any changes in particular device concentrations or properties would have been routine experimentation for one of ordinary skill seeking to maximize device function in the device of Zhang.

With regard to claim 130, Zhang discloses in figures 1a, 1b, and 2a; and column 6, lines 19 – 40 wherein said crystalline semiconductor island comprises a material Ni.

With regard to claim 131, Zhang discloses in figures 1a, 1b, and 2a; and column 6, lines 19 – 40 a thin film transistor wherein said material is included in said semiconductor island at a concentration less than  $5 \times 10^{19} \text{ cm}^{-3}$ . It is not clear if Zhang teaches that the material is included in the semiconductor at a concentration not higher than  $5 \times 10^{19} \text{ cm}^{-3}$ . MPEP 2144.05 states that overlapping ranges are obvious. It would have been obvious to one of ordinary skill in the art to use the material included in the semiconductor at a concentration not higher than  $5 \times 10^{19} \text{ cm}^{-3}$  in the device of Zhang because the current claimed range and the disclosed range in Zhang overlap.

With regard to claim 132, Zhang discloses in column 4, lines 18 – 20 wherein said semiconductor island is a silicon island.

With regard to claim 133, Zhang discloses in column 9, lines 38 – 43 wherein the crystalline semiconductor island includes carbon and nitrogen at a concentration less than  $1 \times 10^{18} \text{ cm}^{-3}$ , and oxygen at a concentration less than  $1 \times 10^{18} \text{ cm}^{-3}$ . It is not clear if Zhang teaches that said crystalline semiconductor island includes carbon and nitrogen at a concentration not lower than  $1 \times 10^{16} \text{ cm}^{-3}$ , and oxygen at a concentration not lower than  $1 \times 10^{17} \text{ cm}^{-3}$ . MPEP 2144.05 states that overlapping ranges are obvious. It would

Art Unit: 2815

have been obvious to one of ordinary skill in the art to use carbon and nitrogen at a concentration not lower than  $1 \times 10^{16} \text{ cm}^{-3}$ , and oxygen at a concentration not lower than  $1 \times 10^{17} \text{ cm}^{-3}$  in the device of Zhang because the current claimed range and the disclosed range in Zhang overlap.

With regard to claim 134, Zhang teaches in figures 1a, 1b, 2a – 2d; and column 12, lines 1 – 30 wherein said monodomain region has a grain size of 50  $\mu\text{m}$  or more. It should be noted that the crystal grains (3) grown around metal portions (2) must have a grain size of 50 – 100  $\mu\text{m}$  when the metal portions are set from 25 – 50  $\mu\text{m}$  apart as disclosed by Zhang in column 12, lines 1 – 30.

With regard to claim 135, Zhang discloses in column 9, lines 38 – 45 wherein each of the concentrations of carbon, nitrogen and oxygen is measured. A method of measuring does not define a patentable feature in a device claim. Therefore, measuring the concentration of carbon, nitrogen and oxygen by the well known technique of secondary ion mass spectroscopy (SIMS) does not bear any patentable weight in this device claim. Further, it would have been obvious to one of ordinary skill in the art at the time of the present invention to use the technique of SIMS to measure the concentration of carbon, nitrogen and oxygen in the device of Zhang in order to understand the electrical characteristics of the device as it relates to these features. This understanding would result in better device control.

With regard to claim 136, Zhang discloses in column 9, lines 38 – 45 wherein each of the concentrations of carbon, nitrogen and oxygen is measured. A method of measuring does not define a patentable feature in a device claim. Therefore,

measuring the concentration of carbon, nitrogen and oxygen by the well known technique of secondary ion mass spectroscopy (SIMS) does not bear any patentable weight in this device claim. Further, it would have been obvious to one of ordinary skill in the art at the time of the present invention to use the technique of SIMS to measure the concentration of carbon, nitrogen and oxygen in the device of Zhang in order to understand the electrical characteristics of the device as it relates to these features. This understanding would result in better device control.

With regard to claim 137, Zhang discloses in column 9, lines 38 – 45 wherein each of the concentrations of carbon, nitrogen and oxygen is measured. A method of measuring does not define a patentable feature in a device claim. Therefore, measuring the concentration of carbon, nitrogen and oxygen by the well known technique of secondary ion mass spectroscopy (SIMS) does not bear any patentable weight in this device claim. Further, it would have been obvious to one of ordinary skill in the art at the time of the present invention to use the technique of SIMS to measure the concentration of carbon, nitrogen and oxygen in the device of Zhang in order to understand the electrical characteristics of the device as it relates to these features. This understanding would result in better device control.

With regard to claim 138, Zhang discloses in column 9, lines 38 – 45 wherein each of the concentrations of carbon, nitrogen and oxygen is measured. A method of measuring does not define a patentable feature in a device claim. Therefore, measuring the concentration of carbon, nitrogen and oxygen by the well known technique of secondary ion mass spectroscopy (SIMS) does not bear any patentable

weight in this device claim. Further, it would have been obvious to one of ordinary skill in the art at the time of the present invention to use the technique of SIMS to measure the concentration of carbon, nitrogen and oxygen in the device of Zhang in order to understand the electrical characteristics of the device as it relates to these features. This understanding would result in better device control.

With regard to claim 139, Zhang discloses in column 9, lines 38 – 45 wherein each of the concentrations of carbon, nitrogen and oxygen is measured. A method of measuring does not define a patentable feature in a device claim. Therefore, measuring the concentration of carbon, nitrogen and oxygen by the well known technique of secondary ion mass spectroscopy (SIMS) does not bear any patentable weight in this device claim. Further, it would have been obvious to one of ordinary skill in the art at the time of the present invention to use the technique of SIMS to measure the concentration of carbon, nitrogen and oxygen in the device of Zhang in order to understand the electrical characteristics of the device as it relates to these features. This understanding would result in better device control.

With regard to claim 140, Zhang discloses in column 9, lines 38 – 45 wherein each of the concentrations of carbon, nitrogen and oxygen is measured. A method of measuring does not define a patentable feature in a device claim. Therefore, measuring the concentration of carbon, nitrogen and oxygen by the well known technique of secondary ion mass spectroscopy (SIMS) does not bear any patentable weight in this device claim. Further, it would have been obvious to one of ordinary skill in the art at the time of the present invention to use the technique of SIMS to measure



the concentration of carbon, nitrogen and oxygen in the device of Zhang in order to understand the electrical characteristics of the device as it relates to these features. This understanding would result in better device control.

With regard to claim 141, Zhang discloses in column 9, lines 38 – 45 wherein each of the concentrations of carbon, nitrogen and oxygen is measured. A method of measuring does not define a patentable feature in a device claim. Therefore, measuring the concentration of carbon, nitrogen and oxygen by the well known technique of secondary ion mass spectroscopy (SIMS) does not bear any patentable weight in this device claim. Further, it would have been obvious to one of ordinary skill in the art at the time of the present invention to use the technique of SIMS to measure the concentration of carbon, nitrogen and oxygen in the device of Zhang in order to understand the electrical characteristics of the device as it relates to these features. This understanding would result in better device control.

With regard to claim 143, Zhang discloses in column 9, lines 38 – 45 wherein each of the concentrations of carbon, nitrogen and oxygen is measured. A method of measuring does not define a patentable feature in a device claim. Therefore, measuring the concentration of carbon, nitrogen and oxygen by the well known technique of secondary ion mass spectroscopy (SIMS) does not bear any patentable weight in this device claim. Further, it would have been obvious to one of ordinary skill in the art at the time of the present invention to use the technique of SIMS to measure the concentration of carbon, nitrogen and oxygen in the device of Zhang in order to

understand the electrical characteristics of the device as it relates to these features.

This understanding would result in better device control.

With regard to claim 144, Zhang discloses in column 9, lines 38 – 45 wherein each of the concentrations of carbon, nitrogen and oxygen is measured. A method of measuring does not define a patentable feature in a device claim. Therefore, measuring the concentration of carbon, nitrogen and oxygen by the well known technique of secondary ion mass spectroscopy (SIMS) does not bear any patentable weight in this device claim. Further, it would have been obvious to one of ordinary skill in the art at the time of the present invention to use the technique of SIMS to measure the concentration of carbon, nitrogen and oxygen in the device of Zhang in order to understand the electrical characteristics of the device as it relates to these features. This understanding would result in better device control.

With regard to claim 145, Zhang discloses in column 9, lines 38 – 43 wherein the crystalline semiconductor island includes carbon and nitrogen at a concentration less than  $1 \times 10^{18} \text{ cm}^{-3}$ , and oxygen at a concentration less than  $1 \times 10^{18} \text{ cm}^{-3}$ . It is not clear if Zhang teaches that said crystalline semiconductor island includes carbon and nitrogen at a concentration not higher than  $5 \times 10^{18} \text{ cm}^{-3}$ , and oxygen at a concentration not higher than  $5 \times 10^{19} \text{ cm}^{-3}$ . MPEP 2144.05 states that overlapping ranges are obvious. It would have been obvious to one of ordinary skill in the art to use carbon and nitrogen at a concentration not higher than  $5 \times 10^{18} \text{ cm}^{-3}$ , and oxygen at a concentration not higher than  $5 \times 10^{19} \text{ cm}^{-3}$  in the device of Zhang because the current claimed range and the disclosed range in Zhang overlap.

With regard to claim 146, Zhang discloses in column 9, lines 38 – 45 wherein the thin film transistor is an n-channel thin film transistor having a mobility in a range of 30 – 150  $\text{cm}^2/\text{Vs}$ . Zhang is silent to the fact that the semiconductor device includes an n-channel thin film transistor having mobility in a range of 500-1000  $\text{cm}^2/\text{Vs}$ . Mobility is a function of the purity of the single crystal (monodomain) semiconductor. MPEP section 2144.04, VII teaches that it is obvious to one of ordinary skill in the art to have a more purely defect free n-channel monodomain region with mobility in a range of 500-1000  $\text{cm}^2/\text{Vs}$  in the device of Zhang. This is because the prior art teaches a suitable method for obtaining the claimed mobility, and that fact that the monodomain region of Zhang has the same utility as that of the claimed invention.

With regard to claim 147, Zhang discloses in column 9, lines 38 – 43 wherein the crystalline semiconductor island includes carbon and nitrogen at a concentration less than  $1 \times 10^{18} \text{ cm}^{-3}$ , and oxygen at a concentration less than  $1 \times 10^{18} \text{ cm}^{-3}$ . It is not clear if Zhang teaches that said crystalline semiconductor island includes carbon and nitrogen at a concentration not higher than  $5 \times 10^{18} \text{ cm}^{-3}$ , and oxygen at a concentration not higher than  $5 \times 10^{19} \text{ cm}^{-3}$ . MPEP 2144.05 states that overlapping ranges are obvious. It would have been obvious to one of ordinary skill in the art to use carbon and nitrogen at a concentration not higher than  $5 \times 10^{18} \text{ cm}^{-3}$ , and oxygen at a concentration not higher than  $5 \times 10^{19} \text{ cm}^{-3}$  in the device of Zhang because the current claimed range and the disclosed range in Zhang overlap.

With regard to claim 148, Zhang discloses in column 9, lines 38 – 45 wherein the thin film transistor is one of a p-channel thin film transistor having a mobility in a range

Art Unit: 2815

of  $20 - 100 \text{ cm}^2/\text{Vs}$ . Zhang is silent to the fact that the semiconductor device includes a p-channel thin film transistor having mobility in a range of  $200-400 \text{ cm}^2/\text{Vs}$ . Mobility is a function of the purity of the single crystal (monodomain) semiconductor. MPEP section 2144.04, VII teaches that it is obvious to one of ordinary skill in the art to have a more purely defect free p-channel monodomain region with mobility in a range of  $200-400 \text{ cm}^2/\text{Vs}$  in the device of Zhang. This is because the prior art teaches a suitable method for obtaining the claimed mobility, and that fact that the monodomain region of Zhang has the same utility as that of the claimed invention.

With regard to claim 149, Zhang discloses in column 9, lines 38 – 43 wherein the crystalline semiconductor island includes carbon and nitrogen at a concentration less than  $1 \times 10^{18} \text{ cm}^{-3}$ , and oxygen at a concentration less than  $1 \times 10^{18} \text{ cm}^{-3}$ . It is not clear if Zhang teaches that said crystalline semiconductor island includes carbon and nitrogen at a concentration not higher than  $5 \times 10^{18} \text{ cm}^{-3}$ , and oxygen at a concentration not higher than  $5 \times 10^{19} \text{ cm}^{-3}$ . MPEP 2144.05 states that overlapping ranges are obvious. It would have been obvious to one of ordinary skill in the art to use carbon and nitrogen at a concentration not higher than  $5 \times 10^{18} \text{ cm}^{-3}$ , and oxygen at a concentration not higher than  $5 \times 10^{19} \text{ cm}^{-3}$  in the device of Zhang because the current claimed range and the disclosed range in Zhang overlap.

With regard to claim 150, Zhang discloses in column 9, lines 38 – 43 wherein the crystalline semiconductor island includes carbon and nitrogen at a concentration less than  $1 \times 10^{18} \text{ cm}^{-3}$ , and oxygen at a concentration less than  $1 \times 10^{18} \text{ cm}^{-3}$ . It is not clear if Zhang teaches that said crystalline semiconductor island includes carbon and nitrogen

Art Unit: 2815

at a concentration not higher than  $5 \times 10^{18} \text{ cm}^{-3}$ , and oxygen at a concentration not higher than  $5 \times 10^{19} \text{ cm}^{-3}$ . MPEP 2144.05 states that overlapping ranges are obvious. It would have been obvious to one of ordinary skill in the art to use carbon and nitrogen at a concentration not higher than  $5 \times 10^{18} \text{ cm}^{-3}$ , and oxygen at a concentration not higher than  $5 \times 10^{19} \text{ cm}^{-3}$  in the device of Zhang because the current claimed range and the disclosed range in Zhang overlap.

With regard to claim 151, Zhang discloses in column 9, lines 38 – 43 wherein the crystalline semiconductor island includes carbon and nitrogen at a concentration less than  $1 \times 10^{18} \text{ cm}^{-3}$ , and oxygen at a concentration less than  $1 \times 10^{18} \text{ cm}^{-3}$ . It is not clear if Zhang teaches that said crystalline semiconductor island includes carbon and nitrogen at a concentration not higher than  $5 \times 10^{18} \text{ cm}^{-3}$ , and oxygen at a concentration not higher than  $5 \times 10^{19} \text{ cm}^{-3}$ . MPEP 2144.05 states that overlapping ranges are obvious. It would have been obvious to one of ordinary skill in the art to use carbon and nitrogen at a concentration not higher than  $5 \times 10^{18} \text{ cm}^{-3}$ , and oxygen at a concentration not higher than  $5 \times 10^{19} \text{ cm}^{-3}$  in the device of Zhang because the current claimed range and the disclosed range in Zhang overlap.

With regard to claim 152, Zhang discloses in column 9, lines 38 – 45 wherein the semiconductor device includes a p-channel thin film transistor having a mobility in a range of 20 – 100  $\text{cm}^2/\text{Vs}$ . Zhang is silent to the fact that the semiconductor device includes a p-channel thin film transistor having mobility in a range of 200-400  $\text{cm}^2/\text{Vs}$ . Mobility is a function of the purity of the single crystal (monodomain) semiconductor. MPEP section 2144.04, VII teaches that it is obvious to one of ordinary skill in the art to

have a more purely defect free p-channel monodomain region with mobility in a range of 200-400  $\text{cm}^2/\text{Vs}$  in the device of Zhang. This is because the prior art teaches a suitable method for obtaining the claimed mobility, and that fact that the monodomain region of Zhang has the same utility as that of the claimed invention. Zhang discloses in column 9, lines 38 – 45 wherein the semiconductor device includes a n-channel thin film transistor having a mobility in a range of 30 – 150  $\text{cm}^2/\text{Vs}$ . Zhang is silent to the fact that the semiconductor device includes an n-channel thin film transistor having mobility in a range of 500-1000  $\text{cm}^2/\text{Vs}$ . Mobility is a function of the purity of the single crystal (monodomain) semiconductor. MPEP section 2144.04, VII teaches that it is obvious to one of ordinary skill in the art to have a more purely defect free n-channel monodomain region with mobility in a range of 500-1000  $\text{cm}^2/\text{Vs}$  in the device of Zhang. This is because the prior art teaches a suitable method for obtaining the claimed mobility, and that fact that the monodomain region of Zhang has the same utility as that of the claimed invention.

With regard to claim 153, Zhang discloses in column 9, lines 38 – 45 wherein the semiconductor device includes a p-channel thin film transistor having a mobility in a range of 20 – 100  $\text{cm}^2/\text{Vs}$ . Zhang is silent to the fact that the semiconductor device includes a p-channel thin film transistor having mobility in a range of 200-400  $\text{cm}^2/\text{Vs}$ . Mobility is a function of the purity of the single crystal (monodomain) semiconductor. MPEP section 2144.04, VII teaches that it is obvious to one of ordinary skill in the art to have a more purely defect free p-channel monodomain region with mobility in a range of 200-400  $\text{cm}^2/\text{Vs}$  in the device of Zhang. This is because the prior art teaches a suitable

Art Unit: 2815

method for obtaining the claimed mobility, and that fact that the monodomain region of Zhang has the same utility as that of the claimed invention. Zhang discloses in column 9, lines 38 – 45 wherein the semiconductor device includes a n-channel thin film transistor having a mobility in a range of 30 – 150  $\text{cm}^2/\text{Vs}$ . Zhang is silent to the fact that the semiconductor device includes an n-channel thin film transistor having mobility in a range of 500-1000  $\text{cm}^2/\text{Vs}$ . Mobility is a function of the purity of the single crystal (monodomain) semiconductor. MPEP section 2144.04, VII teaches that it is obvious to one of ordinary skill in the art to have a more purely defect free n-channel monodomain region with mobility in a range of 500-1000  $\text{cm}^2/\text{Vs}$  in the device of Zhang. This is because the prior art teaches a suitable method for obtaining the claimed mobility, and that fact that the monodomain region of Zhang has the same utility as that of the claimed invention.

With regard to claim 154, Zhang discloses in column 9, lines 38 – 43 wherein the crystalline semiconductor island includes carbon and nitrogen at a concentration less than  $1 \times 10^{18} \text{ cm}^{-3}$ . It is not clear if Zhang teaches that said crystalline semiconductor island includes carbon and nitrogen at a concentration not higher than  $5 \times 10^{18} \text{ cm}^{-3}$ . MPEP 2144.05 states that overlapping ranges are obvious. It would have been obvious to one of ordinary skill in the art to use carbon and nitrogen at a concentration not higher than  $5 \times 10^{18} \text{ cm}^{-3}$  in the device of Zhang because the current claimed range and the disclosed range in Zhang overlap.

With regard to claim 155, Zhang discloses in column 9, lines 38 – 45 wherein the second thin film transistor is one of a p-channel thin film transistor having a mobility in a

range of 20 – 100  $\text{cm}^2/\text{Vs}$ . Zhang is silent to the fact that the semiconductor device includes a p-channel thin film transistor having mobility in a range of 200-400  $\text{cm}^2/\text{Vs}$ . Mobility is a function of the purity of the single crystal (monodomain) semiconductor. MPEP section 2144.04, VII teaches that it is obvious to one of ordinary skill in the art to have a more purely defect free p-channel monodomain region with mobility in a range of 200-400  $\text{cm}^2/\text{Vs}$  in the device of Zhang. This is because the prior art teaches a suitable method for obtaining the claimed mobility, and that fact that the monodomain region of Zhang has the same utility as that of the claimed invention.

Alternatively, even if the Ohtani et al. and Yamazaki et al. evidentiary references are taken as proving for fact that grain boundaries exist in the crystal regions 3 of Zhang, Zhang is still considered to render the claims obvious. Yamazaki et al. teach in figure 5A that the grain boundaries (solid lines differentiating between regions A-H) all extend outward from the corners of the starting region (inner cross-hatched rectangle). If grain boundaries along these directions were applied to the device of Zhang, the grain boundaries would not exist in the channel region. In figures 1(A)-(C) of Zhang, the starting points are formed as squares 2, if these starting squares are superimposed over the devices shown in figure 1(C), and the “grain boundaries” are drawn in extending outward from the corners of the starting squares, one can easily see that the grain boundaries will not exist in the channel region. Thus, even if grain boundaries are formed as taught by Yamazaki, these grain boundaries will not exist in the channel regions of the transistors of Zhang.



5. For the sake of argument, if it can be positively shown that additional grain boundaries (other than those explicitly shown in Zhang) inherently exist in the device of Zhang, and that these additional grain boundaries inherently exist in the channel region of Zhang, the following rejection applies.

6. Claims 73-86, 93-98, 105-110, 129-136, 138, 140, 144-148, 150 and 153 are rejected under 35 U.S.C. 103(a) as being obvious over Zhang et al. (USPAT 5,563,426, Zhang), in view of any one of JP 6-140631, JP 6-037112, US 5273921, or US 5207863.

The applied reference appears to have a common assignee with the instant application. Based upon the earlier effective U.S. filing date of the reference, it constitutes prior art only under 35 U.S.C. 102(e). This rejection under 35 U.S.C. 103(a) might be overcome by: (1) a showing under 37 CFR 1.132 that any invention disclosed but not claimed in the reference was derived from the inventor of this application and is thus not an invention "by another"; (2) a showing of a date of invention for the claimed subject matter of the application which corresponds to subject matter disclosed but not claimed in the reference, prior to the effective U.S. filing date of the reference under 37 CFR 1.131; or (3) an oath or declaration under 37 CFR 1.130 stating that the application and reference are currently owned by the same party and that the inventor named in the application is the prior inventor under 35 U.S.C. 104, together with a terminal disclaimer in accordance with 37 CFR 1.321(c). This rejection might also be overcome by showing that the reference is disqualified under 35 U.S.C. 103(c) as prior art in a rejection under 35 U.S.C. 103(a). See MPEP § 706.02(l)(1) and § 706.02(l)(2).

This rejection is applied in an abundance of caution in order to present applicant with a thorough examination of their claims, in the chance that applicant can definitively prove that grain boundaries exist in the channel region of Zhang.

Zhang et al. teach of render obvious all the limitations of claims 73-86, 93-98, 105-110, 129-136, 138, 140, 144-148, 150 and 153 except for the teaching of the channel forming region having no grain boundaries. Nonetheless, even if grain boundaries are inherently present in the channel forming region of Zhang (a fact that has yet to be proven) it would have been obvious to one of ordinary skill in the art at the time of the invention to modify Zhang so that the channel regions are not formed in the same region as the crystal grain boundaries. JP 6-140631, JP 6-037112 (see paragraph [0008] of the translation, for example), US 5273921 (see column 3 lines 23-27, column 4 lines 25-26 and column 8 lines 36-40, for example), and US 5207863 (see column 9 lines 13-18, for example) all acknowledge that it is advantageous to form a thin film transistor where the channel region is a monodomain region that contains no crystal grain boundaries. These references all teach that the transistor gets better performance when the channel region contains no crystal grain boundaries. Thus, it would have been obvious to one of ordinary skill in the art to modify the transistor of Zhang to form the transistors in regions such that the channels contain no crystal boundaries.

***Response to Arguments***

7. Applicant's arguments filed 12/12/05 have been fully considered but they are not persuasive.

Applicant has argued that Zhang fails to teach, disclose, or suggest the channel forming region having no grain boundaries, the channel forming region is formed in a monodomain region with contains no grain boundaries, or where the crystalline semiconductor island is formed in a monodomain region which contains no grain boundary. Applicant argues that the examiner has not clearly asserted or presented evidence indicating that the device of Zhang has channel forming regions having no grain boundary. Zhang explicitly teaches grain boundaries 4 in specific locations (see figures 1(B) and 1(C) of Zhang) and these locations do not coincide with the location of the channel regions. Since Zhang does explicitly teach grain boundaries, the existence of grain boundaries is not an issue that the reference is silent upon. As such, Zhang explicitly teaches where the grain boundaries are located in their device, and the channel regions of Zhang are explicitly shown as not having grain boundaries. Further, as shown in figure 2(D) the grain boundaries 4 are removed in forming the semiconductor islands such that the islands also contain no grain boundaries. Thus, Zhang itself is evidence that the channel forming regions or islands have no grain boundaries.

Applicant relies upon the teachings of Ohtani and Yamazaki to allegedly show that Zhang will inherently have grain boundaries in the channel region. However, these

references do not establish that Zhang inherently includes grain boundaries in the channel regions. The methods of Ohtani and Yamazaki used to form their crystalline areas, though similar to that of Zhang, contain differences such that they do not constitute proof that the exact method used in Zhang will produce the same grain boundaries as Ohtani and Yamazaki. Any difference in processing, such as the deposition method of the original semiconductor layer, the thickness of the layer, the annealing time and temperature, the annealing atmosphere, or the layers formed above and below the layer when it is crystallized, will have an effect on the crystallization process such that even a minor difference in processing techniques and conditions between Zhang and the Ohtani and Yamazaki references will produce a different result. Applicant has not met their burden of providing evidence that the particular method used by Zhang will inherently contain grain boundaries in the channel region. The Examiner does not have the ability to physically create a device using Zhang's method and test that device to determine if grain boundaries do or do not exist. The examiner must rely upon the teachings of the reference itself, as well as the prior art as a whole, in determining this issue. In this case, the Zhang reference itself explicitly teaches where grain boundaries are located and the prior art of record as a whole does not prove that the method of Zhang will inherently produce grain boundaries in the channel region. Thus, in consideration of all the evidence of record, Zhang reasonably teaches the channel forming region containing no grain boundaries.

Further, even assuming for arguments sake that the teachings of Ohtani and Yamazaki do show that other grain boundaries exist in the Zhang, there is no suggestion that the grain boundaries will be formed in the channel formation region. The grain boundaries as taught by Yamazaki extend outward from the corners of their rectangular starting point (see figure 5A). Applicant has not provided evidence that even if these grain boundaries do necessarily exist in the device of Zhang they will exist in the channel region. If this same pattern of grain boundaries of Yamazaki figure 5A is applied to the structure of Zhang figures 1(A)-1(C), the alleged grain boundaries will not exist in the channel region.

Even further, assuming for arguments sake that the teachings of Ohtani and Yamazaki (or other evidence that applicant might later provide) do teach that grain boundaries are inherently, necessarily present in the channel region of Zhang, the claims are still obvious over the prior art. In section 5 above, the examiner has provided an alternative rejection of certain claims. Specifically, the examiner has shown that even if grain boundaries are assumed to exist in the channel of Zhang, it still would have been obvious to one of ordinary skill in the art at the time of the invention to modify Zhang so that the channel regions are not formed over the grain boundaries. The prior art as a whole (as shown by the four references alternatively applied as the secondary reference in the 103 rejection, specifically JP 6-140631, JP 6-037112, US 5273921, or US 5207863) teaches that it is advantageous to form the channel region such that it has no grain boundaries. Thus, it would have been obvious to one of ordinary skill in the art

to modify Zhang such that regions without crystal grain boundaries are used as the channel regions.


Applicant has also argued that applicants believe that the Examiner is attempting to establish that the no grain boundary feature is inherent in Zhang since if the Examiner had been able to find each and every feature of the claims (presumably referring to the "no grain boundaries" feature) then the rejection would be expected to be under 35 U.S.C. 102 rather than 35 U.S.C. 103. This argument is not persuasive. As clearly explained in the rejections above, what Zhang was missing was an explicit teaching of the various claimed ranges. The rejection had been under 35 U.S.C. 103 since overlapping ranges are obvious and any changes in particular device concentrations or properties would have been routine experimentation or optimization for one of ordinary skill in the art seeking to maximize device function. Thus, the Examiner did have reasoning for rejected the claims under 35 U.S.C. 103 instead of 35 U.S.C. 102 and was not relying upon merely an argument of inherency of the no grain boundary feature. Applicant then argued that the Examiner has not provided any evidence to establish the inherency of the no grain boundary feature. This is not persuasive as Zhang itself provides evidence of this feature. Zhang explicitly teaches where the grain boundaries exist in their device and clearly teach where the channel regions are formed. Though they don't state that the two do not overlap, it is clear from their disclosure that the grain boundaries are not formed in the channel region.

**Conclusion**

Any inquiry concerning this communication or earlier communications from the examiner should be directed to N. Drew Richards whose telephone number is (571) 272-1736. The examiner can normally be reached on Monday-Friday 9:00-5:00.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Ken Parker can be reached on (571) 272-2298. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

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